

# Extreme Astrophysical Accelerators: A Microphysical Perspective



**Frederico Fiuza**  
SLAC  
*Senior Staff Scientist*

## Abstract:

Astrophysical shock waves are among the most powerful particle accelerators in the Universe. Generated by violent interactions of supersonic plasma flows with the interstellar or intergalactic medium, shocks are inferred to amplify magnetic fields and accelerate electrons and protons to highly relativistic speeds. However, the exact mechanisms that allow these shocks to amplify magnetic fields and produce energetic particles so efficiently remain a mystery and cannot be directly resolved in distant astrophysical objects. I will discuss how the fast progress in numerical simulations and laboratory experiments, associated with powerful light sources and accelerator facilities, is opening new windows into the microphysics of these fascinating cosmic accelerators.

